

COMPATIBILITY DETERMINATION

USE: Bicycling To Facilitate Priority Public Uses

REFUGE NAME: Canaan Valley National Wildlife Refuge

DATE ESTABLISHED: August 11, 1994

ESTABLISHING AUTHORITY: Fish and Wildlife Act of 1956, as amended, 16 U.S.C §§ 742a *et seq.* (70 Stat. 1119, Aug. 8, 1956)
Emergency Wetlands Resources Act of 1986, *esp.* 16 U.S.C. § 3901 (100 Stat 3582, Nov. 10, 1986).

PURPOSE(S) FOR WHICH ESTABLISHED:

- (1) For the development, advancement, management, conservation, and protection of fish and wildlife resources. 16 U.S.C. § 742(f)(a)(4).
- (2) For the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill the international obligations contained in various migratory bird treaties and conventions....16 U.S.C. § 3901(b).

MISSION OF THE NATIONAL WILDLIFE REFUGE SYSTEM:

To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans. National Wildlife Refuge System Improvement Act, 16 U.S.C § 668dd(a)(2).

DESCRIPTION OF USE:

(a) What is the use? Is the use a priority public use?

The use is bicycling to facilitate travel for the priority public uses on the Canaan Valley National Wildlife Refuge (Refuge). Priority public uses of the National Wildlife Refuge System are hunting, fishing, wildlife observation and photography, environmental education, and interpretation (16 U.S.C. § 668ee(2); 50 C.F.R. § 25.12).

(b) Where would the use be conducted?

Since the establishment of the Refuge in 1994, bicycling has been allowed on roads open for vehicle travel and a graveled service road on the Beall Tract. These roads, in the southern part of the Refuge, are listed below and will remain open for bicycling at the current level of use:

Forest Road 80 (FR 80)-2.20 miles
Idleman's Run Road-0.21 miles
Beall Tract Road-0.45 miles

The recent refuge addition of 11, 541 acres (Main Tract) includes roads and trails that were used for bicycling before Refuge acquisition. Bicycling to facilitate the six priority public uses is allowed to continue on the roads and trails listed below:

Camp 70 Road and Delta 13 Trail – 1.81 miles
Brown Mountain Trail – 2.38 miles
A Frame Road – 4.84 miles
Cabin Mountain Trail – 1.37 miles
Summit View Trail – 0.79 miles
Middle Ridge Trail – 3.71 miles
Middle Ridge Trail (Extension) – 0.87
Blackbird Knob Trail – 0.65
Glade Run Crossing Trail (S) – 0.90
Glade Run Crossing Trail (N) – 0.75
Blackwater River Trail – 1.33
Swinging Bridge Trail – 1.07

These roads and trails, totaling 23 miles, provide the public with an opportunity to experience Refuge wildlife and plant communities in a diversity of habitats by bicycling. Trails open for bicycles are able to view wildlife and plant species associated with 22 out of 29 total dominant plant communities found on the refuge. Furthermore, two additional plant communities (common rush and black chokeberry) can be seen if bicyclists park and walk on the pedestrian trails closed to bicycle access. Appendix 6 details the dominant plant communities that can be experienced from designated bicycle roads and trails. The roads and trails have existing hard-packed surfaces and meet refuge criteria for route compatibility as shown in Appendix 2: Checklist For Route Compatibility. Roads and trails open for bicycling are shown in Figures 1 and 2. Each road is described in Appendix 3: Routes Found To Be Compatible.

Refuge roads and trails designated for bicycling traverse high elevation wetland, spruce-fir, mixed conifer/hardwood, and northern hardwood forest habitats. Wildlife species occurring in the vicinity of roads and trails include various migratory birds, turkey, white-tailed deer, ruffed grouse, various furbearers, reptiles, and amphibians (Appendix 7). The threatened Cheat Mountain salamander (*Plethodon nettingi*) has been found within the spruce-fir forest that is traversed by FR 80. Refuge inventories have not found this species close to the road. The endangered West Virginia northern flying squirrel (*Glaucomys sabrinus fuscus*) has been documented on refuge property near the end of FR 80.

Many unique and rare plant species occur, or are likely to occur, on the Refuge. At least 26 species of plants found in Canaan Valley have been documented five times or less in

the state of West Virginia. Plants tracked by the West Virginia Division of Natural Resources as state Species of Concern and have documented occurrences in Canaan Valley are listed in Appendix 1. Inventories have shown that some rare plants do grow near or directly adjacent to existing roads and trails.

(c) When would the use be conducted?

Only designated roads and trails are open to bicycling to facilitate priority public uses year-round. An average of 120 inches of snow falls annually in Canaan Valley. Snow removal is not conducted on Refuge roads and trails; therefore, trail-head access may be inaccessible during periods of heavy snowfall. Bicycling usually occurs between April and November with peak use in July through October, depending on weather. To promote safety, bicycling hours are sunrise to sunset and bicycling will only be allowed during the deer (bucks only) gun-hunting season (Beginning the Monday before Thanksgiving and continuing for two weeks) to facilitate hunters access. Bicycle travel for non-consumptive priority public uses during other Refuge hunting seasons is allowed.

(d) How would the use be conducted?

Bicycling to facilitate non-consumptive priority public uses involves observing the natural landscape from a bicycle. Riders stop to observe associated animal and plant communities. The use mainly occurs in groups with an average group size of 2-4 riders. Bicyclists may gather in larger groups for seasonal events like the viewing of fall colors (USFWS, 2002). Regarding consumptive uses, anglers can access refuge land for fishing by bicycle travel on designated routes. Hunters can do the same to access game. Both types of users park bikes on the shoulder of designated bicycle routes and walk by foot to pursue game species. To promote safety with other users, prevent conflicts and promote a quality wildlife observation environment, group size is limited to 10 bicyclists. Groups of more than 10 should contact the refuge office for a Special Use Permit prior to using the trail system. This will help protect refuge resources and ensure that larger groups do not conflict with concurrent public uses.

Bicycle travel on the Refuge is conducted in accordance with the stipulations necessary to ensure compatibility. Travel is limited to designated roads and trails and where road width can accommodate the safe passage of other users. Designated roads and trails also have sufficient viewing distance for bicyclists to detect the approach of other users and maneuver to accommodate them. Riders either travel to the Refuge by bicycle and enter at public entry points or transport bicycles by vehicle and depart from designated parking areas.

The extent of bicycle use on the Refuge is not thoroughly documented. Interviews with local bicyclists as well as recent observations from refuge staff were used to project the anticipated level of use. The level of bicycle use on refuge property has been monitored

by refuge staff since the fall of 2002. Out of 44 monitoring days (mostly weekends) between September 2002 and July 2003, a total of 48 visitors have been documented using bicycle to access the refuge. Anticipated levels of use are higher on Camp 70 road and Forest Road 80 which are more popular with bicycle users. Trails accessed from A-frame road are likely used infrequently and mostly by local residents. Total yearly use levels are likely higher than observed levels. Staff observations have not documented excessive numbers of bicycles on refuge roads and trails.

A Refuge Officer routinely monitors bicyclist numbers seen during patrols, types of access, user interactions, and potential safety concerns. Information and directional signs will be installed at Refuge entry points and at appropriate sites where designated roads intersect other roads and trails. Brochures or maps depicting the roads and trails open for this use will be available at Refuge headquarters and kiosks.

Roads and trails will be maintained in such a manner as is practical to minimize environmental effects such as erosion and sedimentation and to provide safe conditions for travel. Existing potholes that promote off-road detours will be filled or drained appropriately. Roads and trails are monitored annually to determine if they remain compatible subject to the route compatibility determination described in Appendix 2. Any need for additional bicycling routes can be considered during the preparation of the Refuge Comprehensive Conservation Plan (CCP), currently scheduled to begin by 2004. In the interim, the Refuge is conducting an inventory of all existing roads and trails.

(e) Why is this use being proposed?

Bicycle travel on the Refuge provides increased opportunity for the public participation in priority public uses. It is a popular method of travel to view the Refuge's diverse biological assets that can be less physically demanding than pedestrian travel. Designated roads and trails at the southern end of the Refuge provide good opportunities to view forest communities and grasslands. Main Tract roads and trails provide exceptional opportunities to view wetland communities because they offer unrestricted views and most are relatively level for bicycle travel.

According to local bicyclists, bicycle travel on Main Tract roads and trails before Refuge acquisition accessed a variety of wildlife oriented activities. Local outfitters used bicycles to transport clients fishing at beaver ponds. Outfitters led public tours to view fall foliage. Academic institutions, including Davis and Elkins College and civic organizations, including the Boy Scouts, conducted environmental education tours on bicycles. Bicycles were used to access bird watching and to conduct bird surveys (USFWS 2002).

The Refuge Station Management Plan of 1994 states that mountain bikes (bicycles designed for use on trails and unimproved roads) will be considered on designated existing roads and trails. It further provides that the use of mountain bikes on designated roads and trails can be viewed as wildlife-oriented if it provides or enhances the opportunity for people to learn about and enjoy wildlife and wildlife habitats. Although

no Compatibility Determination (CD) was ever written, bicycling has been allowed on Idleman's Run Road, Forest Road 80, and Beall Road in the southern part of the Refuge since 1994. The former Main Tract landowner excluded all-terrain vehicles, motorcycles, and bicycles from the property because of growing concerns related to environmental damage by wheeled vehicles (Monongahela Power Company 1994). A Refuge review however, showed that such damage should not extend to bicycle travel on roads and trails that meet Refuge compatibility criteria (Appendix 2). At the anticipated use level and restricted to designated roads and trails with hardened and modified surfaces, bicycling would cause minimal surface disturbance. No reports exist of conflicts between bicyclists and other users on the Refuge. At the current use level, the sharing of designated roads and trails with other users is unlikely to be a safety risk.

Opportunities for bicycling in forest communities exist on adjacent lands of the Monongahela National Forest and Canaan Valley Resort and Blackwater Falls State Parks creating a system of roads and trails totaling greater than 200 miles. These public lands however, provide few opportunities to observe the unique wildlife and plant communities associated with the Refuge's wetland and adjacent uplands.

AVAILABILITY OF RESOURCES:

The resources necessary to provide and administer this use, at its current use level, are available within current and anticipated Refuge budgets. Staff time associated with administration of this use is related to assessing the need for road maintenance and repair, maintaining kiosks, gates, maintaining traffic counters and recording collected data, conducting visitor use surveys, sign-posting of roads and trails, analyzing visitor use patterns, monitoring potential impacts of the use on Refuge resources and visitors, and providing information to the public about the use.

The Deputy Refuge Manager administers the program. An Outdoor Recreation Planner is responsible for public outreach. A Wildlife Biologist assisted by a term Wildlife Biologist and a Biological Science Technician monitors the environmental effects of public access. A Park Ranger monitors visitor use and user interactions with assistance from the Outdoor Recreation Planner. The Park Ranger and Deputy Refuge Manager conduct law enforcement activities to provide for visitor safety and resource protection.

A Heavy Equipment Operator performs the maintenance and repair of Refuge roads and trails and associated structures. The Refuge has a heavy equipment fleet that includes a motor grader, dump truck, bulldozer, front-end loader, 4x4 farm tractor, bobcat, and backhoe. The construction of a maintenance facility is currently funded and planned for construction in 2004. The maintenance facility will be used to repair vehicles and equipment, construct Refuge kiosks, signs, and gates, and carry out other maintenance operations.

The previously listed Main Tract roads and trails can be significantly improved to restore wetland hydrology. Needed operations include the installation and relocation of culverts and the installation of water bars to properly drain roads and trails. Several segments of the designated routes need gravel to bring the route up to grade. The Refuge staff will perform repairs. The

Refuge currently has one equipment operator on staff. The staffing plan for the Refuge includes two additional maintenance positions. The two maintenance positions are in the Refuge Operating Needs System to be filled in the future. The Refuge currently plans to have the US Department of Transportation, Federal Highway Administration perform road maintenance on FR 80 in 2004. The Refuge may also contract additional repair work as needed to keep roads and trails in safe condition.

Annual costs associated with the administration of bicycling on the Refuge are estimated below:

Road maintenance and repair (filling significant potholes, maintaining water bars, cleaning culverts, brush clearing) sign installation and kiosk construction and repair

WG-10 Equipment Operator for 21 work days = \$3,563.28

Planning and monitoring road conditions and supervising staff to monitor bicycle use and its effects on environment and other visitors

GS-12 Deputy Refuge Manager for 5 work days = \$1,040.40

Law enforcement, monitoring bicycle users and interactions with other users, visitor services, traffic counter maintenance/data collection, sign maintenance

GS-9 Park Ranger for 28 work days = \$4,312.00

Monitoring environmental effects of bicycle use

GS-11 Wildlife Biologist for 5 work days (training & inspection) = \$926.00

GS-9 Wildlife Biologist for 10 work days (monitoring) = \$1,434.40

GS-6 Biological Science Technician for 10 work days (monitoring) = \$1,055.

Providing information to the public and analyzing traffic counter and user data

GS-11 Outdoor Recreation Planner for 14 work days = \$2,754.08

Vehicle fuel / law enforcement patrols = \$210

Heavy equipment fuel = \$150

Kiosk construction, signs, printing maps and information = \$2,500

Grand Total Estimated Costs = \$17,945.26

FY 2003 Budget Allocations:

Employee Salaries and benefits = \$531,981

Fixed costs (utilities, fuel, administrative) = \$26,090

Base maintenance = \$50,000

MMS Project = \$42,250

MMS Road Project = \$30,000

Discretionary Funds (maps, printing, etc.) = \$171,354

Total Available Funds for FY 2003 = \$851,675

Based on existing Refuge expenditures for managing visitor use, funding is adequate to ensure

compatibility and to administer and manage the recreational use listed.

ANTICIPATED IMPACTS OF THE USE:

To evaluate the effects of proposed uses and develop anticipated impacts refuge biologists began by gathering baseline information. Color infra-red aerial photography and field surveys identified existing trails. Locations of “problem areas” (erosion, vegetation loss, etc.) were marked in the field with a GPS and photographs were taken to document problems. All trails marked in the field were integrated into a GIS base map.

Existing information on Canaan Valley wetlands, streams, dominant plant communities and soils were overlaid onto the base map. All soils associated with trails were evaluated for their compaction and erosion potential from information received from an NRCS soil scientist and the Tucker County soil survey. Information from West Virginia Division of Natural Resources (WVDNR) Species of Special Concern database was added to the map. Trails that fragmented habitat and crossed wetland soils were identified.

A comprehensive literature review was conducted of published scientific journal articles detailing impacts to plants, soils, and wildlife through public use activities. Additional information was gathered from biologists, land managers and scientists who had experience with wildlife disturbance and trail management issues.

A contract hydrologist and soil scientist were hired to conduct field investigations of routes proposed for public use. Recommendations were given on limiting factors of these trails and restoration required to make existing trails suitable for continued public use.

A checklist that defines qualifying criteria for existing Refuge roads and trails to be considered as potential travel routes is presented in Appendix 2. Routes found compatible are required to meet all checklist items. The Refuge assessed 67 miles of trail and roads and found 41.5 miles of trail met the Refuge trail checklist guidelines. Main reasons for finding trails incompatible include: 1) trails existing entirely on or crossing over sensitive wetlands; 2) trails on unstable and highly erosive soils; and 3) trails causing hydrologic impacts (i.e., changes in water flow, draining wetlands, etc.) that require substantial restoration to protect plant communities. Potential and anticipated impacts of bicycling as reported in the literature and through field investigations are described below:

Soil Impacts: Bicycle wheels can cause physical impacts to soil surfaces. Cessford (1995) notes the shearing action of wheels creates damage to roads and trails, which increases when trail conditions are wet or when traveling up a steep slope. When traveling down slope, skidding with hard braking can result in loosening soil surfaces, which leads to rutting and erosion by channeling water down wheel ruts. If braking is not performed on downhill travel, the impact of tires on the slope will be much less damaging (Cessford 1995).

The Mauch Chunk derived soil in Canaan Valley is particularly vulnerable to mechanical erosion when vegetation has been removed (Rizzo 2002). This type of erosion may occur when bicycle wheels skid or spin over the soil surface. If compacted, Mauch Chunk soils can facilitate rapid water runoff that accelerates erosion down slope (Rizzo 2002). Field investigations of roads and

trails in Canaan Valley have documented extensive damage, which displays the erosion of Mauch Chunk derived soils after years of degradation. In addition, many roads and trails are now trapping and channeling water creating more erosive conditions. Trails in such a degraded condition are not considered compatible for bicycle use.

Routes designated for this use were selected based on soil conditions that were listed as low risk for compaction and erosion as well as an in-field evaluation of existing conditions (Bell 2002, Rizzo 2002). The designated routes are pre-existing roads that have been previously altered by vehicles and logging equipment, therefore soils are generally compacted and less susceptible to physical impact and mechanical erosion. Based on the conditions of designated routes and the current level use, it is anticipated that bicycle use will cause minor soil erosion and compaction.

Plant Impacts: Vegetation surveys have been conducted in Canaan Valley to document dominant plant communities and as well as rare plant species and plant communities (Fortney 1975, 1997; Bartgis and Berdine 1991). Research to refine vegetation surveys (including rare and exotic species) is currently being conducted by West Virginia University. Information from previous research and trail inspections during 2002 by refuge staff were used to analyze potential impacts to plants.

Bicycle use can cause soil compaction, particularly when soils are wet, which can degrade plant communities associated with fragile organic soils. Soil compaction can diminish the soil porosity, aeration and nutrient availability. These directly affect plant growth and survival (Kuss 1986). Compaction can also limit the re-colonization of areas due to increased difficulty for root growth and penetration in the affected soils (Hammitt and Cole 1998). Kuss (1986) found, plant species adapted to wet or moist habitats are the most sensitive and increased moisture content reduces the ability of the soil to support recreational traffic. In addition, bicycles can directly impact plants by directly crushing the plants themselves.

It is anticipated that bicycles will have some impacts on refuge plant communities growing on the designated travel routes. The designated routes were located predominately on upland soils to prevent impacts to fragile wetland soils and associated plant communities. Rare plant species have not been found on the designated route surfaces themselves, and several routes contain exotic grasses and forbs planted during logging operations prior to refuge acquisition. Based on the current level of use, no significant impacts to plants are likely to occur using bicycles on designated routes.

Invasive Plant Impacts: Exposed soil and an abundance of sunlight along roads and trails provide ideal conditions for the establishment of invasive plant species. Invasions result from the use of foreign material to construct and maintain roads and trails, and from transport via motor vehicles traveling on roads. Currently the known incidence of invasive plant species is low on the Refuge, however a preliminary survey is currently being conducted. Reed canary grass (*Phalaris arundinacea*) has been seen with greater frequency in Canaan Valley's wet meadows and fields. Multiflora rose (*Rosa multiflora*) is often found along roads and power lines. Another invasive, Japanese knotweed (*Polygonum cuspidatum*), has been observed by Refuge staff on Route 32. Yellow iris (*Iris pseudacorus*) is a management concern in wetlands at the Canaan Valley State Park and has been found on the refuge, but not associated with the subject roads and trails.

Areas disturbed by various forms of human travel in Canaan Valley have allowed the colonization of exotic plant species. Stout (1992) found that roads and trails created through emergent wetlands were being colonized by barnyard grass (*Echinochloa crusgalli*), which displaces native plants, and is a species on the State list of invasive exotic plants.

It is anticipated that this use may create bare soil conditions conducive for invasive species growth. Designated routes include old logging roads that have been planted with exotic cover species following logging operations. Wetland areas have been avoided to prevent excessive erosion and native plant mortality. Based on the current level of use, it is not anticipated that bicycle use will cause significant increases in invasive plants relative to the current vegetative community on designated routes.

Hydrologic Impacts: Roads and trails used for bicycle travel can affect the hydrology of an area, primarily through alteration of drainage patterns. Bartgis and Berdine (1991) note that roads and trails can divert water from their original drainage patterns in Canaan Valley. This results in some drainages becoming dry while others accelerate erosion by being forced to carrying more water. Zeedyk (2002) documented many instances in Canaan Valley where existing roads and trails were channeling water away from historic wetlands and in some cases causing erosion and sedimentation of bog and other wetland communities. These problems have profoundly if not irreversibly altered the extent, depths, characteristics and function of the wetlands on the Main Tract (Zeedyk 2002). Routine maintenance to remove water and repair existing erosion is required to sustain bicycling routes (Rizzo 2002, Zeedyk 2002).

It is anticipated that bicycle use could alter drainage features of roads and trails through erosion and compaction. Tires may create trail incision causing increased water channeling and erosion during wet conditions. These problems will be minimized because routes designated for bicycle use are existing logging and skid roads. Based on the current level of use and condition of designated routes, changes to hydrology because of this use are likely to be insignificant.

Wildlife Impacts: Human uses can result in habitat modification, pollution and create disturbances to wildlife. Disturbances vary with the wildlife species involved and the type, level, frequency, duration and the time of year such activities occur. Whittaker and Knight (1998) note that wildlife response can include attraction, habituation and avoidance. Human induced avoidance by wildlife can prevent animals from using otherwise suitable habitat. The effects of roads and trails on plants and animals are complex and not limited to trail width. A 'zone of influence' is described where trail use disturbs areas outside the immediate trail corridor (Miller et al. 2001, Trails and Wildlife Task Force 1998). Miller et al. (1998) describe a 75-meter zone of influence where bird abundance and nesting activities (including nest success) were found to increase as distance from a recreational trail increased in both grassland and forested habitats. Bird communities in this study were apparently affected by the presence of recreational roads and trails, where common species (i.e., American robins) were found near trails and rare species (i.e. grasshopper sparrows) were found farther from trails. Songbird nest failure was also greater near trails (Miller et. al 1998).

Knight and Cole (1991) describe behavioral changes because of disturbance from recreational use. Effects range from short-term shifts in habitat use to complete abandonment of disturbed

areas in favor of undisturbed sites. Disturbance can have negative effects by increasing the energy demands on wildlife. Flight in response to disturbance can lower songbird nesting productivity and cause disease and death. Knight and Cole (1991) suggest recreational activities occurring simultaneously may have a combined negative impact on wildlife. Hammitt and Cole (1998) conclude that the frequent presence of humans in 'wildland' areas can dramatically change the normal behavior of wildlife mostly through 'unintentional harassment'.

Seasonal sensitivities are also important in wildlife responses to human disturbance. For example, when a species is already stressed, human disturbance can compound the effect on the animal. Examples of these disturbances would include regularly flushing birds during nesting or causing mammals to flee during winter months, thereby consuming large amounts of stored fat reserves. Hammitt and Cole (1998) note that females with young (such as white-tailed deer) are more likely to flee from a disturbance than those without young. This indicates increased sensitivity to human disturbance during the breeding season.

Wildlife disturbance by bicycles has been cited for trail closures on the Handley Wildlife Management Area in West Virginia (Dale 2002). Similar disturbances to resident and migratory wildlife species may also become a problem in the Canaan Valley. No historic information on the status and distribution of Main Tract wildlife populations is currently available. Refuge wildlife surveys of the Main Tract were initiated in 2002. No species of special concern have been found directly associated with the roads and trails.

Anticipated impacts of bicycle use on wildlife include temporal disturbances to species using habitat on the trail or directly adjacent to the trail. These disturbances are likely to be short term and infrequent based on the current level of use. Use of some roads and trails may cause direct impacts such as mortality (crushing amphibians foraging on grassy roads and trails) to nest abandonment of bird species nesting on trails. Long-term impacts may include certain wildlife species avoiding trail corridors as a result of this use over time. Routes found compatible for bicycle use are located primarily in continuous tracts of northern hardwood forest on the refuge. Smaller more sensitive wildlife habitat such as riparian, wetland and grassland areas were avoided. Based on information collected from staff observations while in the field and public use surveys conducted by law enforcement officers on staff, the existing level of use is not anticipated to significantly increase wildlife habitat fragmentation or cause significant impacts through disturbance. The subject roads and trails have been consistently used for public access for at least 20 years.

Threatened and Endangered Species Impacts: The Refuge provides habitat for threatened and endangered species. The threatened Cheat Mountain salamander (*Plethodon nettingi*) uses the litter on the forest floor as cover and foraging areas. They are also sensitive to any habitat changes that removes forest canopy or reduces soil moisture and relative humidity (Pauley 1991). Because of this species reliance on high soil moisture and relative humidity, they are not likely to be found on or crossing a road or trail that is exposed to the heating and drying effects of the sun and wind. Cheat Mountain salamander populations have been confirmed at higher elevations in the southern end of the refuge and within 150 feet of FR 80. Because this use will occur on pre-existing roads and trails, no new habitat will be disturbed where the salamander is found.

The endangered West Virginia northern flying squirrel (*Glaucomys sabrinus fuscus*) has been documented on refuge property near the end of FR 80. There is little information available that discusses the effects of trails/roads on populations of this endangered species. However, some research has found northern flying squirrels occupying den sites near logging roads, skid trails, and on hiking trails (Ford 2002). Nest boxes in the vicinity of FR 80 contain nest material consistent with northern flying squirrels.

It is anticipated that bicycle use of the designated routes will not cause significant impacts to threatened or endangered species. The use will be confined to existing roads and trails and no new construction or vegetation clearing will be permitted. Because FR 80 is a historic road used for vehicle access to the refuge and the Dolly Sods Wilderness area, bicycle use will not cause additional significant impacts to these species. Concurrence with the U.S. Fish and Wildlife Service Ecological Services Office in Elkins, WV is necessary to ensure this designated use would not impact threatened or endangered species.

User Conflicts: Conflicts between trail users are commonly reported in the literature (Knight and Gutzwiller 1995, Ramthun 1995, Watson et al 1994, Chavez et al 1993). Conflicts range from concerns over personal safety, to conflicts among user groups. Based on interviews with individuals and user groups, conflicts between groups are not significant in Canaan Valley (USFWS 2002). This is likely due to the relatively low number of users in the area, as compared with heavy use and conflict sites reported in the literature.

Any effects of bicycling on the roads and trails designated are not considered, separately or cumulatively, to constitute significant short-term or long-term impacts. Assessment of potential future impacts was based on available information and current and anticipated level and pattern of use collected from surveys conducted by refuge staff and informal field observations. The current use is viewed as an effective and justifiable method of travel that allows the public to discover, experience, and enjoy priority public uses on the Refuge. Continued monitoring of the effects of bicycling and associated human activities is necessary to better understand the influence of the use on refuge habitats, plant and wildlife communities, and visitors. Monitoring identifies any actions needed to respond to new information (adaptive management) and correct problems that may arise in the future.

Cultural Resources: This use, as described, will not impact cultural resources.

PUBLIC REVIEW AND COMMENT: A draft was sent out for public review and comment on November 6, 2002 for 30 days. Due to public requests, the deadline for public review and comment on this draft compatibility determination was extended for an additional 30 days to January 6, 2003. The refuge also hosted two open houses to address public concerns on November 22, 2002 and December 12, 2002. A determination was made following the comment period.

DETERMINATION: THIS USE IS COMPATIBLE _____

THIS USE IS NOT COMPATIBLE _____ (check one)

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

- Bicycling to facilitate priority public uses is compatible only on the roads and trails designated and described in Appendix 3 and shown on Figures 1 and 2. Evaluation criteria to assess route compatibility are shown in Appendix 2.
- Signs necessary for visitor information, safety, and traffic control will be installed.
- The Refuge will conduct an outreach program to promote public awareness and compliance with Refuge public use regulations.
- Bicycle travel is allowed during Refuge open hours: 1 hour before sunrise until 1 hour after sunset.
- Camping and overnight parking are prohibited.
- Bicycling, except for hunting use is not permitted during the deer, bucks only, gun hunting season or the antlerless deer season (Beginning the Monday before Thanksgiving and continuing for three weeks). Hunters are allowed to use bicycles but they must remain on designated roads and trails.
- Bicycle group size is limited to 10 bicyclists, to promote public safety, accommodate other users, and provide a positive wildlife viewing experience. Group sizes greater than 10 require a Special Use Permit issued by the Refuge manager. Bicyclists traveling only on roads shared with vehicles are not required to obtain a Special Use Permit.
- The surface of Delta 13 Road will be maintained to eliminate water pools and provide adequate drainage.
- An inventory of existing roads and trails on the refuge will be completed before the start of the Refuge CCP. This information will guide future decisions in the planning, locating and managing of Refuge road and trail systems.
- Designated public access routes are monitored annually to determine if they continue to meet the compatibility criteria presented in Appendix 2. The purpose is to assess the long-term effects of the subject use on refuge resources, visitor use, and route maintenance needs. Monitoring for biological and physical resources is listed in Appendix 4 but the methodology may change to reflect new information. Biological inventories continue to provide baseline information to measure changes in conditions over time. Should monitoring and evaluation of the use indicate that the compatibility criteria are or will be exceeded, appropriate action will be taken to ensure continued compatibility, including modifying or discontinuing the use.
- Routine law enforcement patrols are conducted throughout the year. The patrols

promote compliance with refuge regulations, monitor public use patterns and public safety, and document visitor interaction. Patrols will include recording visitor numbers, vehicle numbers, visitor activities, and activity locations to document the current and future levels of Refuge use. Patrols include the routine assessment of safety conditions and visitor interactions on Refuge routes. Conditions that are or will risk public safety will be identified and appropriate action will be promptly taken to correct such conditions.

-The Refuge conducts annual assessments of visitor perceptions of Refuge uses and the management of access routes. A visitor survey will be developed and executed upon approval. Providing for safe public use through proper administration and regulation, public education, and law enforcement will be essential.

JUSTIFICATION:

Bicycling has been determined to be compatible provided the above stipulations are implemented. Bicycle use, as identified in this Compatibility Determination, is not expected to materially interfere with or detract from the mission of the National Wildlife Refuge System or the purposes for which the Refuge was established. The use of bicycles to facilitate the Priority Public Uses is a reasonable mode of access on designated roads and trails. Monitoring will be conducted to ensure this use remains compatible. If significant impacts are found, corrective actions will be taken to protect Refuge resources.

Signature: Refuge Manager:

(Signature and Date)

Concurrence: Regional Chief:

(Signature and Date)

Mandatory 10-year re-evaluation date: August 1, 2013

ATTACHMENTS:

Appendix 1: List of state species of special concern

Appendix 2: Checklist for route compatibility

Appendix 3: Routes found to be compatible

Appendix 4: Route monitoring protocol

Appendix 5: Responses to public comments

Appendix 6: Dominant habitat types viewed from roads and trails

Appendix 7: Wildlife species that may be encountered along roads and trails

Figure 1: Map showing routes designated for public access – North End

Figure 2: Map showing routes designated for public access – South End

Citations

Bartgis, R. and A. Berdine. 1991. A preliminary assessment of biological resources in the Canaan Valley of West Virginia. Report to the Nature Conservancy. 20 pp.

Bell, S. 2002. National Resource Conservation Service. Letter to U.S. Fish and Wildlife Service. 4pp.

Cessford, G. 1995. Off-road impacts of mountain bikes: A review and discussion. Department of Conservation Publication, Wellington, New Zealand. 21pp.

Chavez, D.J, P.L. Winter, J.M. Baas. 1993. Recreational mountain biking: a management perspective. Journal of Park and Recreation Administration. 11(3): 29-36.

Dale, T. 2002. Personal Communication with Tom Dale, West Virginia Division of Natural Resources, Handley Wildlife Management Area, District 3, Pocahontas County, West Virginia. May 2, 2002.

Ford, M. 2002. Personal Communication with Mark Ford, U.S. Forest Service, Parsons, WV. May 3, 2002.

Fortney, Ronald J. 1975. The vegetation of Canaan Valley, West Virginia: A taxonomic and ecological study. West Virginia University. Dissertation. 208 pp.

Fortney, Ronald J. 1997. A chronology of post logging plant succession in Canaan Valley through the development of a series of vegetation maps from 1945 to present. Salem-Teikyo University, West Virginia. 38 pp.

Hammitt, W. E. and Cole, D. N. 1998. Wildland Recreation. John Wiley & Sons, New York, 361pp.

Knight, R.L. and D.N. Cole. 1991. Effects of recreational activity on wildlife in wildlands.

Transactions of the 56th North American Wildlife and Natural Resources Conference pp.238-247.

Knight, R.L. and K. J. Gutzwiller. 1995. Wildlife and Recreationists: Coexistence through management and research. Island Press, Washington, D.C. 371 pp.

Kuss, F. R. 1986. A review of major factors influencing plant responses to recreation impacts. Environmental Management 10:638-650.

Miller, S.G., R.L. Knight, and C.K. Miller. 2001. Wildlife responses to pedestrians and dogs. Wildlife Society Bulletin 29(1): 124-132.

Miller, S.G., R.L. Knight, and C.K. Miller. 1998. Influence of recreational trails on breeding bird communities. Ecological Applications 8:162-169.

- Monongahela Power Company. 1994. News Release. Form 29-237. Rev. 2. 2pp.
- Pauley, T. 1991. Cheat Mountain Salamander (*Plethodon nettingi*) recovery plan. U.S. Fish and Wildlife Service, Newton Corner, MA.
- Ramthun, R. 1995. Factors in user group conflict between hikers and mountain bikers. *Leisure Sciences* 17:159-169.
- Rizzo, A. 2002. Personal communication with Al Rizzo, U.S. Fish and Wildlife Service. April 17-19, 2002.
- Stout, B.M. 1992. Impact of ORV use on vegetative communities of northern Canaan Valley, West Virginia. Wheeling, West Virginia. 24 pp.
- Trails and Wildlife Task Force. 1998. Planning trails with wildlife in mind: A handbook for trail planners. Colorado State Parks, Denver Co. 51pp.
- U.S. Dept. of Agriculture. 1967. Soil Survey, Tucker County. U.S. Government Printing Office, Washington, D.C.
- U.S. Fish and Wildlife Service. 1994. Canaan Valley National Wildlife Refuge Station Management Plan. Hadley, MA. 34pp.
- U.S. Fish and Wildlife Service. 2002. Refuge memo: Summary of meeting to collect Information about bicycle use.
- U.S. Fish and Wildlife Service. 2001. Appalachian northern flying squirrel recovery plan. West Virginia Field Office, Elkins, WV.
- Watson, A.E., M.J. Niccolucci, and D.R. Williams. 1994. The nature of conflict between hikers and recreational stock users in the John Muir Wilderness. *Journal of Leisure Research* 26(4): 372-385.
- Whittaker, D. and Knight, R. 1998. Understanding wildlife responses to humans. *Wildlife Society Bulletin* 26(3): 312-317.
- Zeedyk, B. 2002b. Summary Report of Road Related Wetlands Impacts of the Canaan Valley NWR. 5 pp

Appendix 1 List of State Species Of Special Concern

State Species of Concern Known or Expected to Occur in Canaan Valley, WV

West Virginia Division of Natural Resources Natural Heritage Program

Plants		Ranks	
Scientific Name	Common Name	State	Global
<i>Abies balsamea</i>	Balsam fir	S3	G5
<i>Amelanchier bartramiana</i>	Oblong-fruited serviceberry	S1	G5
<i>Betula papyrifera</i>	Paper birch	S2	G5
<i>Carex aestivalis</i>	Summer Sedge	S2	G4
<i>Carex atherodes</i>	Awned sedge	S1	G5
<i>Carex atlantica</i> ssp. <i>capillacea</i>	Howe sedge	SH	G5
<i>Carex bromoides</i>	Brome-like sedge	S2	G5
<i>Carex buxbaumii</i>	Brown bog sedge	S2	G5
<i>Carex canescens</i>	Hoary sedge	S3	G5
<i>Carex comosa</i>	Bearded sedge	S2	G5
<i>Carex lacustris</i>	Lake sedge	S2	G5
<i>Carex leptoneura</i>	Finely-nerved sedge	S1	G4
<i>Carex pauciflora</i>	Few-flowered sedge	S1	G5
<i>Carex pellita</i>	Wooly sedge	S1	G5
<i>Carex project</i>	Necklace sedge	S1	G5
<i>Coptis trifolia</i> ssp. <i>groenlandica</i>	Goldthread	S2	G5
<i>Cuscuta rostrata</i>	Beaked dodder	S2	G4
<i>Cypripedium reginae</i>	Showy lady's-slipper	S1	G4
<i>Dalibarda repens</i>	Star violet	S3	G5
<i>Drosera rotundifolia</i>	Roundleaf sundew	S3	G5
<i>Equisetum sylvaticum</i>	Woodland horsetail	S1	G5
<i>Euphorbia purpurea</i>	Glade spurge	S2	G3
<i>Geum aleppicum</i>	Yellow avens	S1	G5
<i>Geum rivale</i>	Purple avens	S1	G5
<i>Glyceria grandis</i>	American manna-grass	S2	G5
<i>Glyceria laxa</i>	Northern manna-grass	S1	G5
<i>Juncus articulatus</i>	Jointed rush	S2	G5

<i>Juncus filiformis</i>	Thread rush	S2	G5
<i>Listera smallii</i>	Kidney-leaf twayblade	S2	G4
<i>Lonicera canadensis</i>	American fly-honeysuckle	S2	G5
<i>Oenothera pilosella</i>	Evening-primrose	S2	G5
<i>Pogonia ophioglossoides</i>	Rose pogonia	S2	G5
<i>Polemonium vanbruntiae</i>	Jacob's ladder	S2	G3
<i>Ranunculus pusillus</i>	Low spearwort	S1	G5
<i>Rhamnus alnifolia</i>	Alder-leaved buckthorn	S1	G5
<i>Salix discolor</i>	Glaucous willow	S2	G5
<i>Saxifraga pensylvanica</i>	Swamp saxifrage	S2	G5
<i>Scirpus atrocinctus</i>	Black-girdle bulrush	S3	G5
<i>Scirpus microcarpus</i>	Small-fruit bulrush	S3	G5
<i>Scutellaria galericulata</i>	Hooded skullcap	S1	G5
<i>Stachys tenuifolia</i> var. <i>tenuifolia</i>	Smooth hedge-nettle	S2	G5
<i>Stellaria borealis</i> ssp. <i>borealis</i>	Northern stitchwort	S1	G5
<i>Synosma suaveolens</i>	Sweet-scented Indian-plantain	S2	G3G4
<i>Thelypteris simulata</i>	Bog fern	S1	G4G5
<i>Torreyochloa pallida</i> var. <i>fernaldii</i>	Manna-grass	S2	G5?
<i>Torreyochloa pallida</i> var. <i>pallida</i>	Pale manna-grass	S2	G5?
<i>Vaccinium macrocarpon</i>	Large cranberry	S2	G4
<i>Vaccinium oxycoccos</i>	Small cranberry	S2	G5
<i>Veronica scutellata</i>	Marsh speedwell	S1	G5
<i>Viola appalachiensis</i>	Appalachian blue violet	S2	G3
<i>Vittaria appalachiana</i>	Appalachian gametophyte	S1	G4
<i>Zigadenus leimanthoides</i>	Oceanorus	S2	G42

Animals		Rank	
Scientific Name	Common Name	State	Global
<i>Accipiter gentilis</i>	Northern goshawk	S1B,S1N	G5
<i>Aegolius acadicus</i>	Northern saw-whet owl	S2B,S3N	G5
<i>Carphophis amoenus</i>	Worm snake	S3	G5

Chlosyne harrisii	Harris' checkerspot	S2	G4
Circus cyaneus	Northern harrier	S1B,S3N	G5
Clinostomus elongatus	Redside dace	S1S2	G4
Colias interior	Pink-edged sulphur	S1	
Empidonax alnorum	Alder flycatcher	S3B,S3N	G5
Euphyes bimacula	Two-spotted skipper	S1	G4
Glaucomys sabrinus fuscus	West Virginia northern flying squirrel	S2	G5
Neotoma magister	Allegheny woodrat	S3	G3G4
Microtus chrotorrhinus carolinensis	Rock vole	S2	G4
Plethodon nettingi	Cheat Mountain salamander	S2	G2
Sorex palustris punctulatus	Water shrew	S1	G5
Sylvilagus obscurus	Appalachian cottontail	S3	G4
Zapus hudsonius	Meadow jumping mouse	S3	G5

- West Virginia Division of Natural Resources 2001
Ranking Descriptions

-
- S1 Five or fewer documented occurrences, or very few remaining individuals within the state. Extremely rare and critically imperiled.
 - S2 Six to 20 documented occurrences, or few remaining individuals within the state. Very rare and imperiled.
 - S3 Twenty-one to 100 documented occurrences.
 - S4 Common and apparently secure with more than 100 occurrences.
 - S5 Very common and demonstrably secure.
 - SH Historical. Species which have not been relocated within the last 20 years. May be rediscovered.
 - G1 Five or fewer documented occurrences, or very few remaining individuals globally. Extremely rare and critically imperiled.
 - G2 Six to 20 documented occurrences, or few remaining individuals globally. Very rare and imperiled.
 - G3 Twenty-one to 100 documented occurrences. Either very rare and local throughout it's range or found locally in a restricted range; vulnerable to extinction.
 - G4 Common and apparently secure globally, though it may be rare in parts of it's range, especially at it's periphery.
 - G5 Very common and demonstrably secure, though it may be rare in parts of its range, especially at the periphery.
 - G? Unranked, or, if following a number, rank uncertain (ex. G2?)
 - G_Q Species of questionable taxonomy (ex. G4Q).
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Appendix 2 Checklist For Route Compatibility

Checklist For Existing Routes To Be Eligible For Interim Compatibility Consideration

(Routes must meet all criteria)

- 1) Route provides an opportunity to view a variety of habitats and wildlife.
- 2) Route is an existing road or trail that provided access or is in close proximity to access that supported priority public uses.
- 3) Route is safe for the access proposed at current use levels.
- 4) Any refuge entry route was open to public access based on historic use.
- 5) Route requires minimal annual maintenance (i.e, waterbars, stepping stones, etc.) to ensure safe access and to prevent further habitat degradation.
- 6) Route has a low potential for fragmenting habitat or disturbing wildlife populations.
- 7) Based on existing soils information, less than 50% of the route's length occupies soil types rated as "high" or "very high" for compaction and/or erosiveness. The route is not rated as "severely limited" for hiking trails based on the Tucker County Soil Survey.
- 8) Any route crossing of sensitive soils occupies the shortest possible distance. Organic soil crossings are minimized or eliminated.
- 9) Continued use of the existing route is not likely to cause further wetland alteration or degradation. There is low risk that hydrology, soil stability, sensitive plant communities, riparian zones, and wildlife habitats would be adversely affected.
- 10) Route predominately occupies modified substrate (graveled, compacted, or filled) like logging roads and rail grades.
- 11) Route is not incised greater than 1 foot deep over 10% of its total length.

Appendix 3 **Compatible Routes**

Forest Road 80 (1.91 mi): This road has been in existence for decades. It has been minimally maintained and is currently only passable to vehicles with clearance. The road surface is highly modified, packed and graveled in sections. Planned maintenance operations will improve drainage and stabilize the road surface. This road was found acceptable for bicycle travel due the fact that it is highly modified and is not causing unacceptable erosion and sedimentation problems. Bicycle travel of this road will not cause trail widening, increasing erosion, trail incision, trampling of vegetation or unacceptable disturbance to wildlife species. This road does not cross wetland soils on the refuge. Although this road crosses habitat suitable for cheat mountain salamanders and West Virginia northern flying squirrel, it is likely that there will be no significant impacts to these species through the continued use of this route in its current condition.

Idleman's Run Road (0.21 mi): This is a highly modified road branching from FR 80 running north. It has been in existence for many years and has been compacted, graded and graveled in the past. Use of this road on the refuge will terminate at the Idleman's Run crossing (refuge boundary). This road is acceptable for bicycle travel as it does not cause unacceptable erosion and sedimentation and is in stable condition. Continued bicycle travel of this road will not cause increased trail widening, trail incision, soil erosion and stream sedimentation or trampling of vegetation. It does not cross organic wetland soils.

Delta 13 Road and Trail (1.81 mi): This road originates at the western Refuge boundary from Camp Seventy Road and continues until it contacts wetland soils. There is a small loop at this point that allows an overlook of the wetland complex. The majority of the road is located on upland soils which appear to be stable and packed. The trail segment adjoining Camp Seventy Road appears to have been graveled at one time. There are heavily rutted sections with many potholes that capture water. As a result users have begun widening the road to avoid the water holes and muddy areas. Management action will be taken to either drain the pools of water or bridge them to prevent continued braiding and trail widening around these points. Large rocks may be placed through the potholes for bicycle travel. Continuing bicycle travel along this route, with such management, will not likely cause significant erosion or vegetation trampling. There are documented rare and sensitive plant species in the wetlands surrounding the terminus of this road. No rare plants have been documented on the road surface. The road exists partly on the edge areas of the riparian corridor, the forest and wetland complex and does not appear to fragment habitat.

A Frame Road (4.8 mi): A Frame road joins state route 93 at the north end of the Canaan Valley. It crosses through private land until it meets the refuge boundary. The refuge segment is 4.9 miles long from the Main Tract boundary at the north to the intersection with the Glade Run wetland complex. This road is well developed and has been graded and graveled in the past. Soils are compacted through years of vehicle use and the continued use of this road for bicycles will not significantly damage soils and plant communities. Although minimally maintained, it remains serviceable and provides access throughout the year. A Frame Road is relatively level and does not reflect the erosion patterns of steeper tracks and secondary roads that branch from it. Bicycle travel of this road will not cause any significant changes in soil erosion, compaction, downstream sedimentation or vegetation trampling.

A Frame Road terminates in a section of existing railroad grade that connects the southern end of A Frame Road. The trail provides access into a beaver pond complex along the Glade Run drainage. The rail grade is raised, filled and in stable condition. Allowing access on this grade will not cause significant erosion or sedimentation into the surrounding wetlands. The section of trail between the end of A Frame road and the rail grade is in worse shape and has been degraded by years of vehicle use. However, minimal maintenance operations on this short section can allow bicycle access to the rail grade without increasing or significantly continuing soil erosion and wetland sedimentation.

Cabin Mountain Trail (1.35 mi): The section of road connecting to A Frame Road has been partially eroded and is channeling water. Along this section exposed soil has not had an opportunity to revegetate. However, this road continues on a stable logging road that has been vegetated and modified in the past through grading and filling. There are at least 24 small streams and springs that cross this trail but are not causing significant erosion problems. Bicycle travel is not likely to cause significant soil erosion, compaction or vegetation trampling. Areas of concern include the beginning of the trail where bare soils are exposed and previous water channeling has created some rutting. Trail maintenance will be necessary in such areas to prevent erosion and sedimentation. Stream and spring crossings will be armored to prevent bank erosion.

Middle Ridge Trail (3.68 mi): This is a historical road used recently for logging operations. It is heavily modified and has been graded and graveled. Recent logging cleanup operations included providing road drainage and seeding to prevent excessive erosion. This has no public access from the south as it borders private property. The road requires basic infrastructure such as culverts and better drainage to reduce its impact on the local hydrology. The northern end of this road is incised and is channeling water for over a half mile, the result of many years of vehicle use. The route connects to a historic railroad grade that ends at Glade Run. The railgrade is a filled and raised bed that is in good condition. It requires only minor maintenance to move water off the trail. Bicycle travel of this trail will not cause significant increases in erosion or stream sedimentation. There are rare plant species documented in wetland habitat adjacent to the Glade Run end of the trail. No rare plant species have been documented on the trail surface itself.

Summit View Trail (.79 mi): This road provides access to the higher elevations of Cabin Mountain and was historically used to connect to Forest Service property. It begins near the end of A Frame road and consists of a narrow logging road ascending the ridge. Water bars are still functional and are preventing water from channeling long distances down the trail. Soils are mostly compacted and bare although some sections have considerable rock base that is helping to stabilize the trail. Soils are predominately listed as having a low compaction and comparatively low erosion potential. Bicycle travel will not cause significant soil erosion or vegetation trampling. The road is not channeling water but will require minor maintenance to prevent deterioration.

Brown Mountain Trail (2.35 mi): This route starts on the Delta 13 Road and connects to a logging road that runs north along a contour of Brown Mountain. This road exists on upland soils and has only a few short stream crossings. Soils are predominately rated as having a low potential for compaction and moderate to low potential for erosion. The logging road that runs north is a well established and previously graded road that follows a contour on Brown

Mountain. It has functioning waterbars and is not incised. Bicycle travel of this road will not cause significant erosion, compaction, or vegetation trampling.

Middle Ridge Trail (Extension of original trail) (0.87 mi): This route joins the Middle Ridge Trail and the property boundary of the Timberline Homeowner's Association (THA). This is a historical road used recently for logging operations. It is heavily modified and has been graded and graveled. Recent logging cleanup operations included providing road drainage and seeding to prevent excessive erosion. The road requires basic infrastructure such as culverts and better drainage to reduce its impact on the local hydrology. Pedestrian, horseback, and bicycle travel of this trail will not cause significant increases in erosion or stream sedimentation. There are rare plant species documented in the wetlands near the Glade Run end of the trail. No rare plant species have been documented on the trail surface itself.

Glade Run Crossing North (0.75): This route joins A-Frame Road to the north end of Middle Ridge Trail. Soils on this trail have low erosion and low to moderate compaction potential. The greatest source of compaction and erosion is anticipated to occur where the trail crosses Glade Run. Rare plant species and rare bird species have been documented near this section of trail. No rare plant species have been documented on the trail surface itself. This trail will require maintenance and restoration efforts (i.e., streambank stabilization), particularly where the trail crosses Glade Run, to alleviate and prevent further deterioration. At current use levels pedestrian, horseback, and bicycle travel are not anticipated to cause significant increases in erosion or stream sedimentation.

Glade Run Crossing South (0.90 mi): This route is accessed from the A-Frame road parking lot and crosses Glade Run to join up with Middle Ridge Trail. Soils on this trail have low compaction and erosion potential, except where the trail crosses Glade Run and compaction and erosion potential is relatively high. The location where the trail crosses Glade Run was selected based on its ability to support pedestrian, bicycle, and horseback travel with minimal impact to the soils and watershed. This trail was made compatible by rerouting a section around exposed Mauch Chunk derived soils that can contribute to substantial erosion, compaction, and Refuge maintenance. Additionally, the area being avoided is heavily incised and carries water during precipitation events. This route requires maintenance to clear the new section of trail and maintain the total length of the trail. The crossing will be monitored and require maintenance and soil stabilization to prevent deterioration, particularly where the trail crosses Glade Run. Bicyclists are required to carry their bikes across Glade Run to prevent further trail deterioration.

Blackwater River Trail (1.33 mi): This route is located near the southern border of the Main Tract and is accessed from the Middle Ridge Trail. The Blackwater River Trail goes east and ends at the Blackwater River where Refuge property ends. This is a historic road used recently for logging operations. It is heavily modified and has been graded and graveled. Recent logging cleanup operations included providing road drainage and seeding to prevent excessive erosion. The road requires basic infrastructure such as culverts and better drainage to reduce its impact on the local hydrology. Pedestrian, horseback, and bicycle travel of this trail will not cause significant increases in erosion or stream sedimentation.

Blackbird Knob Trail (0.65 mi): This trail provides access to the higher elevations of Cabin Mountain and was historically used to connect to Forest Service property. It begins at the end of Cabin Mountain Trail and consists of a narrow logging road ascending the ridge. Water bars are still functional and are preventing water from channeling long distances down the trail. Soils are

mostly compacted and bare although some sections have considerable rock base that is helping to stabilize the trail. Soils are predominately listed as having a low compaction and comparatively low erosion potential. Pedestrian, bicycle, and horseback travel should not cause significant soil erosion or vegetation trampling. The trail is not channeling water but will require minor maintenance to prevent deterioration.

Appendix 4 Route Monitoring Plan

Physical Characterizes:

A baseline inventory on the physical condition of access routes open to public use was conducted during the 2002 field season. This information will be used to monitor how continued public use affects plants and soils associated with current designated routes. Changes in physical conditions of the routes will be used to identify any management interventions required to protect refuge resources. Interventions will occur where surveys document increases in the frequency and lineal extent of “problem areas”. Current trail conditions on much of the refuge were primarily influenced by the use of motorized vehicles prior to acquisition by the USFWS. The standard that will be set for refuge trails is a non-degradation policy such that existing “problem areas” will not increase in size, number or frequency. It is intended that access limitations will improve currently degraded vegetation and soil conditions. Improvement will be defined as reducing “problem areas” by : narrowing trail width, decreasing numbers of “bootleg” trails through revegetation, fewer mud holes, less soil erosion, and fewer areas of exposed roots. Information generated from this survey will include the following products:

- A description of the frequency of “problem areas” on targeted trails
- A description of the average physical characteristics of trail features
- A description of the lineal extent of “problem areas”
- A repeatable monitoring protocol that will track the trend of physical condition of refuge trails.
- Trail management recommendations to halt continued trail degradation and vegetation trampling and promote revegetation.

Biological Monitoring:

Wildlife associated with public access routes will be monitored to detect any impacts from public use. Monitoring will occur seasonally to document how species use of associated habitats is affected throughout yearly life cycles. Point counts during early summer will be used to inventory nesting bird species and to compare results with areas not influenced by public access.

Transects will be established and monitored to determine how different species are influenced by the presence of a particular trail or road (i.e. for brood habitat, nesting, movement corridors etc.). Amphibian and avian surveys will be conducted during early spring for breeding and late summer for movements. Monitoring during winter will evaluate the importance of routes to mammals for winter movements and feeding areas. Vegetation surveys will be conducted to detect the presence of rare, unique or exotic invasive plant species located on public access routes.

Inventory results will be reviewed annually to ensure that designated routes continue to meet compatibility requirements. Management intervention to correct significant problems will occur if monitoring indicates that public use is impacting wildlife or plant species and/or populations. Remedies will be based on the significance of impacts and practical options for reducing or eliminating them. Intervention may include investigative research projects.

Figure 1: Map showing routes designated for public access by bicycle on the Refuge's north end.

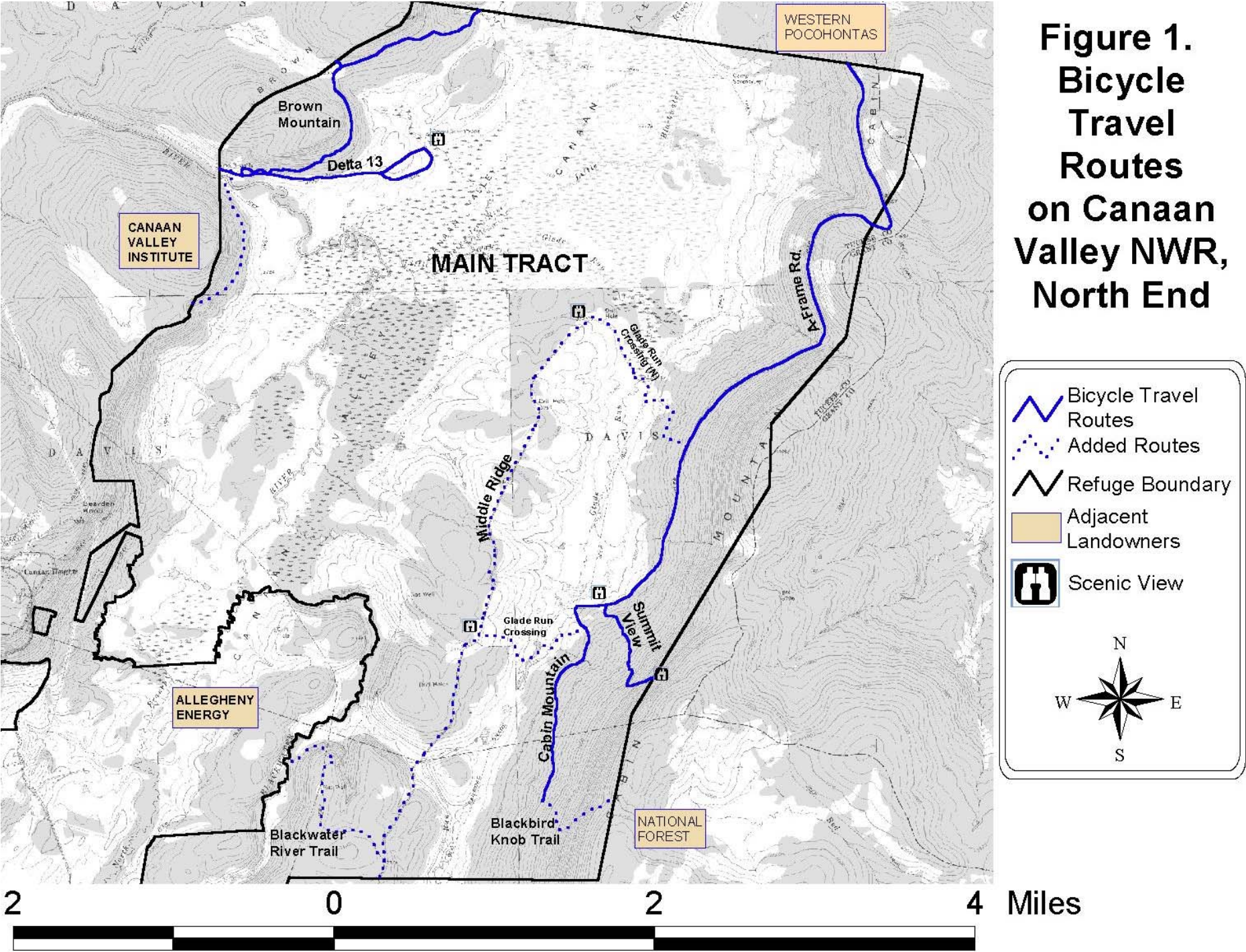


Figure 2: Map showing routes designated for public access by bicycle on the Refuge's south end.

